APPLICATION
WATER POLLUTION CONTROL FACILITY CONSTRUCTION PERMIT
REQUIRED BY INDIANA REGULATION SPC-15

PLEASE READ INSTRUCTIONS BEFORE COMPLETING APPLICATION

1. This application is for the construction or expansion of:

   A. [ ] cyanide isolation facilities

   B. [ ] municipal sewerage facilities

   C. [X] commercial or manufacturing treatment facilities

   D. [ ] agricultural or silvicultural treatment facilities

   E. [ ] semi-public treatment facilities

2. Legal name of applicant

   United States Steel Corporation

3. Mailing address of applicant

   Gary Works

   1 North Broadway

   Gary, Indiana 46401

4. Applicant's authorized agent

   NAME G. J. Behrens

   TITLE Manager, Technical Services

   ADDRESS Gary Works, MS-188

   1 N. Broadway, Gary, Indiana 46401

   PHONE NO. (include area code) (219) 944-4365

5. Name, address and location of facility where construction will occur.

   NAME See Item 3

   ADDRESS See Item 3

   LOCATION South of Blast Furnace Scalpers/

   Settling Basins

12709

6. Receiving Water(s)

Discharge 017 (GW-5) to Grand Calumet River

A. [ ] new discharge B. [X] Existing discharge

7. Is this construction for (a)

A. [X] new system B. [ ] expansion of existing system

8. Required Information.

A. Attached to this application upon submittal must be detailed plans and specifications and other information required in the instructions.

B. The applicant shall furnish upon request such supplementary information as is required by the Director in order to evaluate fully the application.

9. Fees

An application fee of $10 must be submitted with this application. The check or money order should be made payable to the Environmental Management Special Fund. (Do Not Send Cash)

10. Signature

Application is hereby made for a permit to authorize the activities described herein. I certify that I am familiar with information contained in this application, and to the best of my knowledge and belief such information is true, complete, and accurate.

G. J. Behrens
Printed name of person signing

Manager, Technical Services
Title

G J Behrens
Signature of applicant

1/30/78
Date application signed

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WRITTEN SUMMARY
BLAST FURNACE RECYCLE BLOWDOWN TREATMENT
GARY WORKS

Part	Item
I.	General Process Description
A.	Effluent Pretreatment System
B.	Alkaline Chlorination System
C.	Carbon Adsorption System
D.	Chemicals - Handling System

1. Sulfuric-Acid Handling System
2. Caustic - Handling System
3. Chlorine - Handling System
4. Hypochlorite - Generation System
5. Emergency Chlorine Disposal System

I. General Process Description

Treatment of blowdown water from the Gary Works blast-furnace gas-cleaning/cooling-water recycle system is conducted in an integrated facility consisting of four discrete systems:

1. Effluent pretreatment
2. Alkaline chlorination
3. Carbon adsorption
4. Chemicals handling

The treatment involves three processes which are briefly described as follows:

A. Effluent Pretreatment System:

The function of this system is to prepare the blowdown water for final physical-chemical treatment by alkaline-chlorination and carbon treatment. To accomplish the objectives of providing pH-controlled, solids free water for final treatment, three principal operations are performed: pH adjustment, clarification, and pressure filtration, along with the supporting functions of sludge removal and dewatering.

After pretreatment, the clarified effluent is directed from the pressure filters to an effluent surge tank which provides one day's surge volume when completely full. This surge tank system is designed to partially dampen out the anticipated compositional swings in the blowdown.

B. Alkaline Chlorination System

In this system, the primary function is chemical oxidation of ammonia, phenols and degradable cyanides to principally nitrogen and carbon dioxide by controlled reaction with chlorine applied in the form of sodium hypochlorite.

The chlorination process is operated as a two-stage reaction system with the first stage providing 20 minutes reaction time at a pH of 9.5 to destroy the ammonia and convert amenable cyanide to cyanate. In the second stage, the pH is controlled at 7.5 with 40 minutes retention time which, in conjunction with carrying a free chlorine residual of 10 ppm, is sufficient to complete the destruction of cyanate. To achieve this two-stage effect, a single 180,000 gallon basin is divided into six cells. Each cell is equipped with individual instrumentation for monitoring performance and controlling the process.

C. Carbon-Absorption System

In the carbon-adsorption system, two primary functions are performed: reduction of the residual chlorine level in the effluent to an acceptable level for discharge by principally catalyzing the chlorine elimination reactions and assuring control of the phenolic content of the effluent at less than 50 ppb by adsorption of the phenols on activated carbon.

D. Chemical Handling System

To support the three-stage blowdown treatment process as described above, substantial handling of bulk chemical commodities are required. Basic raw materials required are sodium hydroxide (caustic), chlorine and sulfuric acid. This chemical handling system involves railroad side spurs for chlorine and caustic tank cars, truck unloading facilities for sulfuric acid, storage and mixing facilities and an emergency chlorine disposal system. A brief description of these chemical handling systems are:

1. Sulfuric-Acid-Handling System

Sulfuric-acid handling is the simplest of the handling systems since it services a single treatment system, the alkaline chlorination, and has a fairly constant usage rate varying primarily with water flow rate through the operation. Provision is made for handling concentrated 66° Baume (93%) acid either by tank truck (in approximately 2600-gallon lots) or by tank car (a 10,000-gallon lot).

2. Caustic-Handling System

Delivery of caustic will be by tank car lots and provision is made to handle two 16,000-gallon tank cars (containing 50.5 tons each of pure NaOH as 50% solution) at one time on a separate siding. The tank cars are unloaded via the caustic-unloading circulating pump directly to the 50% caustic storage tank (100,000 gallons).

From the storage tank, the 50 percent caustic is pumped on demand to either the sodium hypochlorite generation facilities or to a static mixer where the solution is diluted to 20 percent. Following dilution, the caustic-handling system branches to two other points of use:

a. Pretreatment pH adjustment tanks

b. Alkaline chlorination pH control in the first stage cells

3. Chlorine-Handling System

The last bulk chemical commodity consumed in the process is chlorine. Again, like the caustic, delivery is by tank car in the form of liquid chlorine in lots of 55 tons per car. The tank cars themselves provided the only on-site storage.

From the tank car, the liquid chlorine flows on demand to the hypochlorite generation facilities.

4. Hypochlorite-Generation Section

The production of 15 percent sodium hypochlorite solution takes place in the Powell continuous bleach plant. This unit, designed and developed by Dow Chemical Company, combines liquid chlorine, 50 percent caustic solution, and water to make sodium hypochlorite solution of various concentrations.

A chlorine vapor treatment tank is provided to destroy any chlorine vapor that could exist in any closed vessels that would hold sodium hypochlorite solution. In its normal state, this tank will hold a full charge of 20 percent caustic solution.

5. Emergency Chlorine Disposal System

Although, with proper precautions, chlorine can be handled safely, there always exists the possibility of conditions wherein a chlorine leak can develop and be unstoppable with normal patching kits and the chlorine inventory in a tank car must be removed from the car faster than it is normally being drawn by process demand. If, at this capacity, an unsafe situation still exists, additional chlorine can be discharged from the car as vapor through separate discharge valves. This chlorine vapor is conducted through a special emergency chlorine vent line to the emergency chlorine dump tank where it is absorbed and reacted with caustic.

The emergency dump tank is designed to hold enough caustic to completely dump the contents of one full 55-ton chlorine tank car.

Environmental Control Department
January 29, 1978
Gary Works

Attachment #1

FLOW SCHEMATIC FOR GARY WORKS BLAST FURNACE RECYCLE SYSTEM

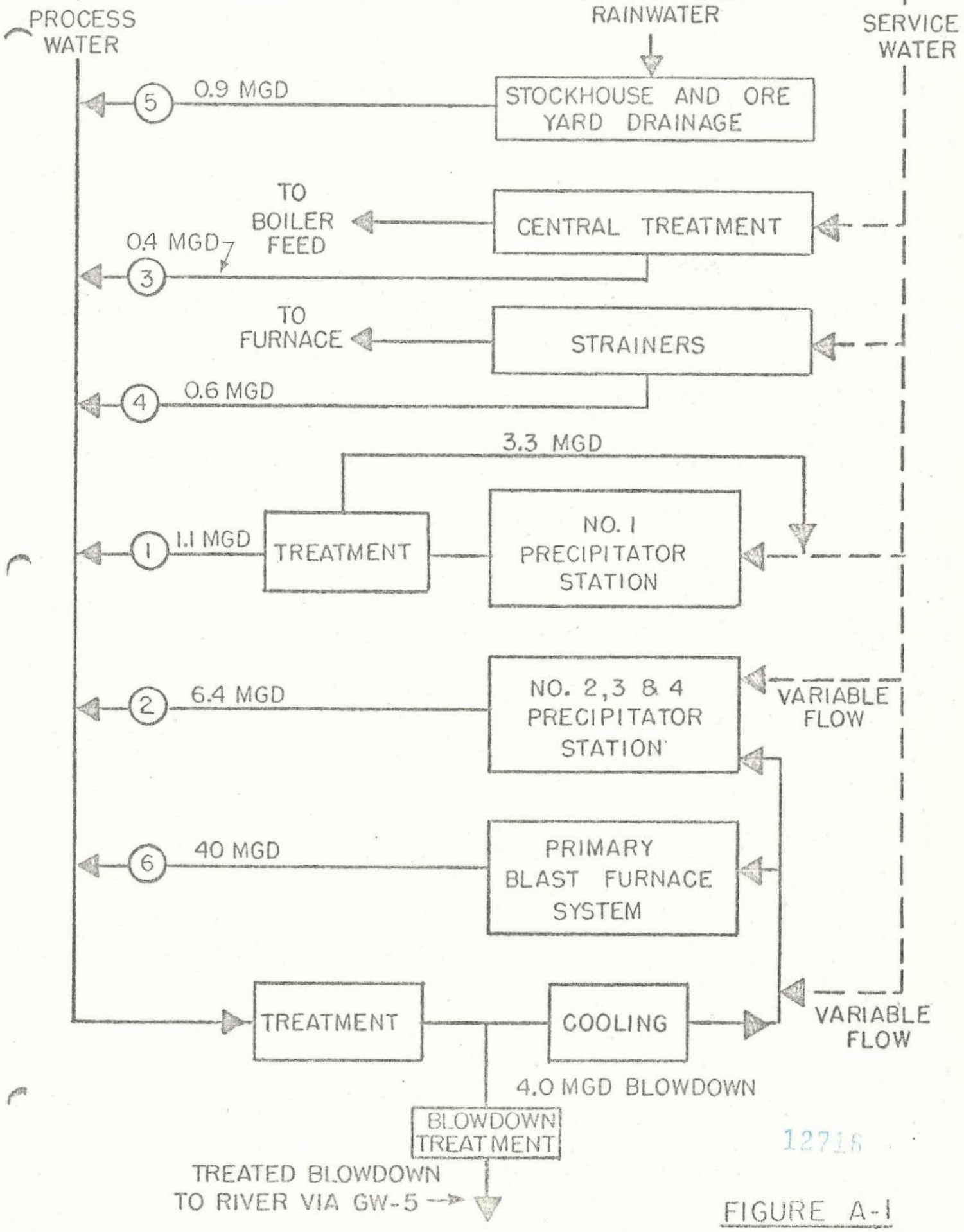

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FIGURE A-1

Attachment #2

The expected removal efficiencies are based on long-term averages and are expressed as pounds/day loadings and are found in Column D below.

A. Parameter	B. Influent Loadings to System	C. Effluent Loadings from System	D. Pounds/Day Removed
Suspended Solids	1,670 lb/day	170 lb/day	1,500 lb/day
Ammonia	3,172 lb/day	67 lb/day	3,105 lb/day
Cyanide	208 lb/day	43 lb/day	165 lb/day
Phenol	160 lb/day	2 lb/day	158 lb/day
Fluoride	565 lb/day	565 lb/day	0 lb/day
Oil & Grease	81 lb/day	0 lb/day	81 lb/day
Sulfates	10,075 lb/day	45,300 lb/day	- 35,225 lb/day*
Chlorides	22,620 lb/day	58,220 lb/day	-35,600 lb/day*

*Due to proposed treatment process, this system will increase pound loadings to the Grand Calumet River for the above noted parameters. These loadings are based on current evaluations and are subject to change with further process developments.

Gary Works
Environmental Control
January 17, 1978

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Attachment #3

SCHEDULE OF COMPLIANCE

Outfall No. 017 (GW-5)
Alkaline-Chlorination Treatment Plant

Start Construction of Pilot Plant	Completed
Submit Analysis of Pilot Plant Operation (Analysis to include a report on the chlorinated hydrocarbons generated and discharged, and a report presenting anticipated mass loadings (annual mean, daily average and maximum) for chlorides, fluorides and sulfates upon achieving compliance with the final limitations for ammonia, cyanide and phenolics)	August 1, 1977
Submit Preliminary Design Plans	February 1, 1978
Submit Progress Report (Report to include information on status of construction permit, approval of funds, and any revisions in expected discharges of chlorides, sulfates, and fluorides)	May 1, 1978
Start of Construction	October 1, 1978
Submit Progress Report (Report to include submittal of final plans, report on status of equipment orders and deliveries, and any revisions in expected discharges of chlorides, sulfates and fluorides)	February 1, 1979
Submit Progress Report (Report to include report on status of equipment orders and deliveries, status of construction, and revisions in expected discharges of chlorides, sulfates and fluorides)	October 1, 1979
Submit Progress Report (Report to include status of construction identification of any item that might affect scheduled completion, and any revisions in expected discharges of chlorides, sulfates and fluorides based on differences between pilot plant influent and recycle system blowdown)	March 1, 1980
Complete Construction	June 1, 1980
Attain Operational Level	August 1, 1980

The purpose of the program is to develop and install the treatment technology necessary to treat wastewaters containing ammonia, cyanide and phenolics to meet the final discharge limitations in the modified NPDES permit, Exhibit A.

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4. ENGINEERING DATA - [redacted] - Cyclone Separator, Classifier, Vacuum Disc Type Filter

4.1 General

1. Slurry from the scalper underflow pump shall be treated by passing through equipment described in this section.

2. Particles size distribution:

+80 Mesh	3.7%
-80 to 100 Mesh	1.4%
-100 to 140 Mesh	3.0%
-140 to 200 Mesh	5.1%
-200 to 325 Mesh	9.4%
-325 Mesh	77.4%

4.2 Cyclone Separators

1. Three (3) cyclone separators shall be provided, two (2) operating and one (1) standby. Two (2) separators shall be capable of removing particles to 68 mesh range at 1,800 GPM flow rate. Sludge loading shall be approximately 340 tons/day.

2. The separators shall be mounted above the spiral classifier and discharge to an inlet box to the classifier. The entire unit shall not be higher than 16'-0".

3. The separators shall be made up of a minimum of five (5) removable flanged sections, each with its own replaceable rubber lining.

4. Coneliners shall be 3/4 inch thick rubber and shall have a 30-40 durometer rating (Shore A).

5. Involute entry area shall be approximately 70 square inches.

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4. ENGINEERING DATA (Continued)

4.3 Spiral Classifier

One (1) spiral classifier shall be provided and sized to handle approximately 150 GPM of cyclone separator underflow and remove up to one ton per hour of grit to 100 mesh.

1. Clarifier Tank

a. The tank shall have a full flare with side wires and overflow.

b. The tank shall be rigidly braced and include all necessary structural steel supports to maintain a 3-1/2 inch per foot slope.

c. The tank shall conform to the following approximate dimensions:

Tank length	13-feet 0 inches
Tank width at grit discharge end	2-feet ten inches
Tank width at effluent end	4-feet six inches
Maximum tank depth	2-feet six inches
Pool area	25-square feet
Tank slope	3-1/2-inches per foot
Tank plate thickness	3/16-inches

2. Spiral

a. The spiral shall be constructed of steel plate welded on steel extending arms on a six inch diameter seamless pipe. The spiral flights shall have Ni-Hard outer wearing shoes.

b. The shaft shall rotate in a submerged bearing on the effluent end.

c. The shaft shall be capable of being raised one(1) foot three (3) inches at the effluent end by a manual screw device.

d. The shaft shall be driven by a 460 volt, 3 phase, 60 Hertz, motor-variable speed.

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4. ENGINEERING DATA (Continued)

4.4 Disc Filter System

1. Two (2) vacuum disc type filters shall be provided and be of the heavy duty type, successfully used and proven in similar flue dust thickener underflow applications.

2. The filters shall meet the following requirements:

Number of vacuum filter units	-	Two (One operating, one standby)
Type of filter	-	Disc
Type of cloth media	-	Polypropylene
Type of discharge	-	Compressed air and scraper
Design capacity	-	340 tons/day
Design rate	-	As required
Filter cake design moisture content	-	25%
Agitation required	-	Yes
Disc speed	-	Variable
Number of vacuum pumps	-	Two
Number of vacuum receivers	-	Two
Number of filtrate pumps	-	Two
Number of compressors	-	Two
Pressure Lube System	-	One

3. The filtering equipment will be used with one (1) unit in operation and the other on standby. Operation shall be based on 24-hours per day and seven (7) days per week.

4. The discharge shall utilize compressed air to expand the individual disc segments against a discharge scraper.

5. The filter tank shall be constructed of 1/4 inch thick steel plate to provide extended life capabilities under expected operating conditions.

6. Centershaft shall be sectionalized for easy replacement.

7. A minimum of ten (10)replaceable sectors per disc shall be provided.

8. The tank shall have two (2) 3-inch sludge inlet nozzles, 6-inch flanged drain, 8-inch flanged overflow connection on full length of overflow collection trough, full length feed box providing feed ports between all discs for even feed distribution.

9. Each vacuum filter unit shall be provided with a rotary wet type pump sized to provide sufficient vacuum for each filter. Pumps shall have V-belt drive, belt guard, discharge silencer, vacuum relief valve, high temperature shut-down switch, low oil pressure shut-down switch, seal water connection, water shut off solenoid valve and 480 volt, 3 phase, 60 Hertz, TEFC Motor.

4. ENGINEERING DATA (Continued

4.4 Disc Filter System (Continued)

10. Each unit shall be provided with a vacuum receiver of sufficient size to insure optimum vacuum filter performance.

11. Each unit shall be provided with a filter pump and 480 volt, 3 phase, 60 hertz motor. Pump capacity shall be 100 GPM @ 60 feet TDH.

12. Each unit shall be provided with moisture trap of sufficient size to insure optimum vacuum filter performance.

13. Each unit shall be provided with a snubber of sufficient size to insure noise level per Standard Specification No. 3013-1.

14. Each unit shall be provided with one (1) filter cake discharge packaged compressed air system consisting of compressor, V-belt drive, guard, constant speed regulation, high air temperature switch, receiver, inlet filter, silencer, 480 volt TEFC motor, sized for one (1) operating vacuum filter.

4.5 Water Analysis

Total dissolved solids	3600 ppm
Alkalinity	800 ppm
Suspended solids	50 ppm
PH	7.5 to 8.5
Cyanide	8 ppm
Phenol	0.05 ppm
Iron	1 ppm
Zinc	0.35 ppm
Heavy Metals (Ph, Cd, Cu, Cr)	1 ppm each
Ammonia	50.0 ppm
Phosphorus	0.05 ppm
Calcium Hardness	1200 ppm

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Page 6 & 7 of 30 are replaced by revised pages 6 & 7 of 30.

Expiration Date

This modification is proposed to expire May 31, 1988, as with the current permit.

Drafted by Mark W. Stanifer